

### **Supplementary Material 1**

**Table I** An example of the keyword search and combination when searching Medline

Database	Keyword search
<i>Medline</i>	<p>((("Citizen Scien*") OR (Participat*) OR (Collaborati*) OR (Engage*) OR (Partnership*) OR ("Community-based") OR (Advocacy) OR (Photovoice) OR (Communit*) OR ("Citizen Engage*") OR (CBPR) OR ("Community-Based Participatory Research") OR ("Our Voice") OR (Co-production) OR ("Participatory Action") OR ("Public Participation") OR ("Public Engagement") OR ("Participatory Research") OR ("Community Engage*") OR (Community-led) OR (Co-production) OR ("Active Engage*")) <b>AND</b> ((Urban*) OR (Built*) OR ("Urban Environment") OR ("Built Environment") OR (Outdoor*) OR (City) OR (Cities) OR (Age-Friendl*) OR ("Inclusive Communit*") OR ("Physical Environment") OR (Neighbourhood)) <b>AND</b> (("Active Ageing") OR ("Healthy Ageing") OR ("Successful Ageing") OR ("Ageing Well") OR ("Positive Ageing") OR ("Productive Ageing") OR ("Meaningful Ageing") OR (Ageing)) <b>AND</b> (("Older Adult") OR (Older) OR ("Older Woman") OR (Older Women) OR (Older Man) OR (Older Men) OR (Senior) OR (Elder) OR (Community-dwelling)))) kw, ti, ab.</p>

## **1. Citizen Science Appraisal Tool Section Descriptors**

### *(1) Science & Research*

Section 1 identifies the aims, objectives, and/or goals of the study and clarifies that a CS approach has been used. This can demonstrate the validity and appropriateness of the research design and methods,<sup>[1, 2]</sup> and if studies have intentionally designed their approaches to demonstrate good quality CS. The presence of these aspects can strengthen CS and transition it towards being viewed as 'genuine' science in the traditional scientific community.<sup>[3]</sup>

### *(2) Leadership and Participation*

Section 2 demonstrates the degree of active engagement of citizens within the study and the presence of a partnership between citizens and scientists, which are both principles presented by ECSA.<sup>[4, 5]</sup> Clear and planned engagement of citizens, with engagement of citizens throughout the entire process preferential, can demonstrate good quality.<sup>[3, 5]</sup> A transparent partnership and expectations can further strengthen the level of CS engagement, as it can shift citizens from 'participant' to 'active researcher'.<sup>[4]</sup>

### *(3) Data and delivery*

Section 3 identifies studies who have fully engaged citizens in the data collection, analysis and dissemination processes. This level of active engagement is encouraged in CS approaches and demonstrates good quality CS.<sup>[4, 6]</sup> This section also identifies if studies have considered the quality and reliability of data, as well as any biases, errors or limitations that may be present, which is important for CS findings to be integrated and trusted within the scientific community.<sup>[7, 8]</sup>

#### *(4) Outcomes, evaluation and open data*

Section 4 identifies the level of CS engagement throughout the study processes, the presence of sustainable or 'real world' outcomes, critical evaluations of citizens or the study processes, and intentional mechanisms for disseminating outcomes, which are all indicators of good quality CS.<sup>[3-5]</sup> Fully engaging and empowering citizens, such as through co-production, aligns with ECSA CS values for preferred levels of engagement.<sup>[4, 5]</sup> The presence of 'real world' impacts or pathways can demonstrate sustainability of CS activities, such as through the continuation of community-engage CS activities,<sup>[6, 9-11]</sup> which are key for strengthening CS projects (Albert et al., 2021). Providing a critical evaluation of a study's processes can demonstrate quality, trustworthiness, and transparency,<sup>[4]</sup> and the evaluation of citizen knowledge or intended behaviours can indicate quality assurance of a project's delivery and ensuring participant understanding or learning.<sup>[3]</sup> Lastly, having accessible and open dissemination of outcomes is good practice <sup>[4]</sup> and can provide the opportunity for

citizens to 'see' their data, which can lead to long-term sustainability of CS studies.<sup>[3, 5]</sup>

## **Citizen Science Appraisal Tool Levels of Engagement**

This review uses three different types of participation to guide the review provided by King et al. <sup>[12]</sup> These are:

**1) 'For the people'** – Contributory level of citizen science where citizens have limited engagement and are only involved to provide data (i.e. usually in the form of personal information or a biological sample). All other aspects of the research process are directed by the researchers.

**2) 'With The People'** - A type of collaborative citizen science where citizens actively and systematically collect data on a specific phenomenon (i.e. citizens involved in bird counts or online crowdsourcing). The data is then analysed, interpreted and disseminated by researchers and not citizen scientists.

**3) 'By the people'** – Produces a partnership or collaboration between citizen scientists and researchers in which citizens actively engage in the entire research process to drive and steer questions, objectives, collection, and interpretation of data, and developing and advocating outcomes and changes.

Studies can use the following methods, approaches or key words to describe this participation at any stage of design or methods to be included: (1) Citizen science (2) Citizen scientist/s or Citizen engagement; (3) Participatory (research, approaches, methods); (4) Participatory Action; (5) Collaborative/Collaboration; (6) Engagement; (7) Partnership; (8) Resident-engaged; (9) Community-Based Participatory Research (CBPR); (10) Advocacy/Advocate; (11) 'Our Voice'; (12) Co-production; (13) For the people; (14) By the people; (15) With the people.

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